

REMARKS

Claims 1-28 are pending in the captioned application and were addressed in the office action. All of the claims were rejected on various grounds under 35 U.S.C. 102 and 103.

Rejection of Claims 1, 2, 13-17 and 21-24 Under 35 U.S.C. 102

Claims 1, 2, 13-17 and 21-24 stand rejected under 35 U.S.C. 102 as being anticipated by U.S. Patent 3,995,526 to Shannon.

The foregoing amendments render the stated ground of rejection moot, because claims 1 and 2 have been canceled, and claims 13 and 21 have been amended to include the limitations of claims 18 and 25, respectively, which were not deemed to be anticipated by Shannon. Since all of the independent claims pending as a result of the amendments include the limitations of dependent claims that were not anticipated by Shannon, the amendments to the claims have rendered the stated ground of rejection moot.

Shannon discloses a method for making detonating cord that comprises a PETN explosive core, and by which the PETN is rendered resistant to deactivation by water. Shannon's process involves applying silicone oil onto a transport tape which is then formed into a tube into which PETN particles are fed to form a consolidated core for the detonating cord. After manufacture, the silicone oil migrates into the PETN. The Applicants respectfully point out that even without the foregoing amendments, Shannon was not properly viewed as anticipating the rejected claims, because even prior to the amendments entered herewith, each of the independent claims recites a detonating cord having a solid core of explosive material and a diluent present in an amount which reduces the velocity of detonation of detonating cord. Nowhere in Shannon is there a disclosure of the mixture of a diluent into the explosive core of the detonating cord disclosed therein in an amount that would reduce the velocity of detonation of a signal therethrough. Therefore, the foregoing amendments were not necessary in order to overcome their asserted anticipation by Shannon.

Rejection of Claims 3-7, 18, 20 and 25-28 Under 35 U.S.C. 103

Claims 3-7, 18, 20 and 25-28 stand rejected under 35 U.S.C. 103 as being obvious over Shannon in view of U.S. Patent 3,338,165 to Minnick. The Examiner cites Minnick for showing the use of microballoons in the core explosive of a detonating cord, and asserts that it would be obvious from Minnick to employ the microballoons in the detonating cord shown by Shannon. For the following reasons, the stated ground of rejection is respectfully traversed.

Minnick discloses a detonating cord having a nitromethane core sensitized by finely divided, air-entrapping material, in particular, microballoons. The nitromethane is either in the normally liquid form in the gelled form (see column 1, lines 10-27). The addition of air-entrapping material sensitizes the nitromethane (see column 2, lines 7-11).

It would not be obvious to incorporate the sensitizing balloons shown in Minnick into the detonating cord disclosed by Shannon because the performance characteristics of the Minnick detonating cord are significantly different from those of the Shannon detonating cord. In particular, the Minnick detonating cord comprises an explosive core of nitromethane. As pointed out in the Rule 132 Declaration accompanying this response, nitromethane is known to have a significant oxygen deficit (see, e.g., the enclosed copies of pages 243-244 of Explosives, by Rudolf Meyer, 2nd edition, verlag chemie 1981, showing an oxygen balance of -39.3%). A person of ordinary skill in the art would recognize that the sensitizing function of microballoons in Minnick is a result of their provision of oxygen to be consumed by the nitromethane to enable an explosion process to occur in the cord. In contrast, Shannon discloses a detonating cord having a core of explosive material. By definition, explosives are capable of undergoing chemical reaction without the need for additional reactants, such as oxygen. Therefore, the function of the microballoons shown in the Minnick Patent (i.e., the crucial provision of oxygen), would not appear to be needed in relation to detonating cord comprising a core of explosive material as described in Shannon, so the prior art fails to provide a motive for incorporating microballoons as shown in the Minnick Patent into the core of the Shannon Patent detonating cord. Accordingly, the stated ground of rejection of claim 3 is respectfully traversed.

Claim 18 has been canceled, but the subject matter thereof has been directly incorporated into claim 13, from which claim 18 previously depended. Accordingly, the asserted ground of rejection against claim 18 can now be considered to be applied against claim 13 as amended. Claim 13 defines a method for cleaving a rock formation that makes use of a detonating cord substantially as described in claim 3, i.e., a cord having a core of material comprising a first pulverulent explosive and a diluent comprising explosively inert microballoons. The incorporation of microballoons into a core of pulverulent explosive in a detonating cord is not obvious for reasons set forth above. Therefore, claim 13 and the claims dependent therefrom are patentably distinguishable from the applied references.

The limitation of claim 25 has now been incorporated into claim 21, so the rejection of claim 25 will now be addressed in relation to claim 21, which now claims a method for making detonating cord including mixing a diluent comprising inert microballoons into a pulverulent ex-

plosive enclosed within a sheath, to provide a detonating cord. The mixture of inert microballoons with the pulverulent explosive results in a novel, non-obvious detonating cord, for reasons set forth above.

Rejection of Claims 8-12 and 19 Under 35 U.S.C. 103

Claims 8-12 and 19 stand rejected under 35 U.S.C. 103 as being obvious over Shannon in view of the U.S. Patent 3,789,759 to Jones.

Claim 8 has been amended to depend from claim 3, which is allowable for reasons set forth above. Neither Shannon nor Jones teach or suggest the use of microballoons in the core of a detonating cord comprising pulverulent explosive material. Accordingly, the amendments to claims 3, 8 and 13 render the stated ground of rejection moot.

Rejection of Claims 1, 2, 8-17, 19 and 21-24 Under 35 U.S.C. 102

Claims 1, 2, 8-17, 19 and 21-24 stand rejected under 35 U.S.C. 102 as being anticipated by U.S. Patent 3,789,759 to Jones.

The foregoing amendments introduce into all of the pending claims the limitations of claims 3, 18 and 25, which were not found to be anticipated by Jones. Accordingly, these amendments render the stated ground of rejection moot.

Rejection of Claims 3-7, 18, 20 and 25-28 Under 35 U.S.C. 103

Claims 3-7, 18, 20 and 25-28 stand rejected under 35 U.S.C. 103 as being obvious over Jones in view of Minnick, the Examiner alleging that it would be obvious to incorporate the microballoons shown in Minnick in the detonating cord shown by Jones.

Jones shows a detonating cord having a core comprising high explosives (see column 5, lines 49-54) and optional diluents, inerts and low explosive ingredients. However, as pointed out above, explosives do not require added oxygen to produce an explosive output, as shown by Minnick. Therefore, these references provide no motive to make the combination asserted by the Examiner.

However, even if a *prima facie* case of obviousness were to be made, it would be overcome by the fact that the Applicants have discovered an unexpected result from the incorporation of microballoons into the explosive core of detonating cord, i.e., that the performance of the detonating cord with respect to the splitting of rock formations is significantly enhanced, apparently as the result of a significant reduction in the velocity of detonation through the detonating cord. No such

effects are predicted in the prior art as a result of the use of microballoons as a diluent for the pulverulent explosive material in the core of the detonating cord. For this reason, even if the applied references could be combined in a manner that would support a *prima facie* rejection of the claims, such rejection would nonetheless be overcome on the basis of the supporting disclosure of this application.

In view of the foregoing amendments and remarks, reconsideration and reexamination of the claims is respectfully requested.

Respectfully submitted,



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